Relations among regional aquifers, local hydrogeologic units, and geologic formations—PLATE 1

Age	NORTH CAROLINA		VIRGINIA		MARYLAND Western Shore		AND DELAWARE Eastern Shore of Maryland and Delaware		NEW JERSEY Updip Section Downdip			NEW YORK Section (Long Island)		
	Subregional Hydrogeologic Unit	Geologic Unit	Subregional Hydrogeologic Unit	Geologic Unit	Subregional Hydrogeologic Unit	Geologic Unit	Subregional Hydrogeologic Unit	Geologic Unit	Subregional Hydrogeologic Unit	Geologic Unit	Subregional Hydrogeologic Unit	Geologic Unit	Subregional Hydrogeologic Unit	Geologic Unit
Holocene	Surficial aquifer	Holocene dep., und.	Columbia aquifer	Holocene dep., und.	Surficial aq.	Holocene de s. und.	Surficial aquifer. Confining	Kent Island Parsons: Sinepustent Formation	Extensions of underlying ags	Holocene deposits, und.	Holly Beach aguifer Holly Beach	Holocene dep. und. Cape May Formation	Upper glacial aquifer	THE RESERVE AND DESCRIPTION OF THE PERSON NAMED IN COLUMN 2 IN COL
Pleistocene	Surficial aquifer	Pleistocene deposits, undifferentiated	Columbia aquifer	Pleistocene deposits, undifferentiated	Surficial aquifer	Pleistocene deposits, undifferentiated	unit guilling aq.	Form. Older Quater- nary beds Omar Form.	underlying aqs.	deposits, und.	aquifer Cape May c.u.		Gardiners Clay c Jameco equifer	Gardiners Cla and und Jamero Gravel Mannetto Gravel
Pliocene	Confining unit Yorktown aquifer	U. Pliocene dep. und. Yorktown Form.	Yorktown-Eastover aq.	Vorktown Form.			Confining unit Surficial aquifer	Walston Silt Beaverdam Sand		12 - 1 4			U. glacial aq	
	Yorktown aquifer	Eastover Formation	Yorktown-Eastover aquifer	Eastover Formation	Lower Surficial Chesapeake aquifer confining	Eastover Formation	Chesapeake Surficial confining unit Upper	Pensauken Formation Eastover Formation	Extensions of underlying	Pensauken Formation		3 6 3		
	Confining unit		St. Marys c.u.	St. Marys	unit	g St. Marys	U. Chesapeake aq.	Maryland: D	aquifers					
Miocene		- C. N	St. Marys-Choptank aquifer	Formation Choptank Formation	Lower Chesapeake	Formation Choptank	St. Marys confining unit	St. Marys Formation Chesapeake Group, undifferentiated	Kirkwood-Cohansey aquifer system (upper part)	Bridgeton Formation Cohansey Beacon Hill Gravel	Kirkwood-Cohansey aquifer system	Bridgeton Formation Cohansey Beacon Hill Sand Gravel		
	Confining unit Pungo River aquifer Confining unit	Pungo River Formation	Calvert confining unit	Calvert Formation	30, ming unit	Formation Calvert Formation	Chesapeake aquifer	Calvert Formation	Kirkwood-Cohansey aquifer system (lower part) Basal Kirkwood c.u.	Kirkwood Formation	C.u. Rio Grande water-bearing zone C.u. Atlantic City 800-ft Sand Basal Kirkwood c.u.			
	Confining unit	Belgrade Formation	. Chickahominy-	Old Church	Lower Chesapeake c.u.	Old Church	Lower Chesapeake c.u.				Piney Point Basal Kirkwood	Old Church(?) Formation		11.3
Oligocene	Castle Hayne aquifer	River Bend Formation	Piney Point aquifer	Formation	Piney Point-Nanjemoy aq.	Formation	Piney Point-Nanjemoy aq.	Formation beds			Piney Point aquifer Kirkwood	Unnamed beds		100
			Chickahominy- Piney Point aquifer	Chickahominy Formation										
Eocene	Castle Hayne aquifer Confining unit	Castle Hayne Limestone	Chickahominy- Piney Point aguifer Chickahominy-Piney Point ag	Piney Point Formation	Piney Point- Nanjemoy aquifer Piney Point- Nanjemoy aquifer	Piney Point Formation	Piney Point- Naniemov a quifer Piney Point- Nanjemoy aquifer	Piney Point Formation Maryland: Delaware:	Piney Point aquifer	Piney Point Formation Shark River Formation	Piney Point aquifer	Piney Point Formation Shark River Formation		16000
	-		Nanjemoy-Marlboro confining unit	Nanjemoy Formation Marlboro Clay	Nanjemoy-Marlbord confining unit	Nanjemoy Formation Marlboro Clay		Nanjemoy Formation Marlboro Clay	Vincentown- Manasquan confining unit	Manasquan Formation	Vincentown- Manasquan confining unit	Manasquan Formation Vincentown		
Paleocene	Confining unit Beaufort aquifer	Beaufort Formation	Aquia aquifer	Aquia Formation	Aquia Rancocas aquifer U. Brightseet c.u.	Aquia Formation	Aquia-Rancocas aquifer	Aquia Rancocas Group	Vincentown aquifer	Formation		Formation		
	Confining unit		Brightseat c.u.	Brightmat Formation	Lower Brightseat c.u.	Brightseat Formation	U. Brightseat Lower Brightseat C.u.	Bright seat Formation	Navesink- Hornerstown confining unit	Hornerstown Sand	Navesink- Hornerstown confining unit	Hornerstown Sand		
	Confining unit		Upper Potomac confining unit	Uppermost Cretaceous beds, undifferentiated	Severn aquifer	Severn		rn Form.	Navesink- Hornerstown confining unit	Tinton Sand Redbank Sand Navesink Form.	Navesink- Hornerstown confining unit	Tinton Sand Redbank Sand Navesink Form.		Monmou
	Peedee aquifer	Peedee Formation			Severn c.u.	Formation	Severn aquifer Severn c.u.		Wenonah-Mount Laurel aquifer	Mt. Laurel Sand Wenonah Form.	Wenonah-Mount Laurel aquifer	Mt. Laurel Sand		Group, undiffer entiated
	Confining unit Confining unit			1, 10° h	Matawan	Matawan	Matawan aguifer	≥ 5 Matawan	Marshalltown- Wenonah c.u. Englishtown aquifer	Marshalltown Form,	Marshalltown-Wenonah confining unit Englishtown aquifer			
	Black Creek aquifer	Black Creek formation		71.3	confining unit	Formation		undiffer- entiated	Merchantville- Woodbury confining unit	Woodbury Clay Merchantville Form.	Merchantville- Woodbury confining unit	Woodbury Clay Merchantville Form.		
Late Cretaceous	aquitei	Middendorf Formation		37/8	Magazhu	Magothy Formation	Matawan c.u. Magothy	Manathu	Upper Potomac-				Magothy aquifer	Matawan and Magothy Formation undifferentiated
Cretaceous	Confining unit				Magothy aquifer	Formation	aquifer	Magothy Formation	Raritan–Magothy aquifer	Magothy Formation	Upper Potomac- Raritan-Magothy			
	Upper Capa Fear	Capa Fear Formation		- 78		1-10		MEN			aquifer			lean I
	Confining unit		Upper Potomac c.u.			1		100	Confining unit		Confining unit		Raritan confining unit	Clay Member
		TER	Upper Potomice Ca.				Patapsco c.u.	Maryland: Delaware:	Middle Potomac- Raritan-Magothy aquifer	Raritan Formation	Middle Potomac- Raritan-Magothy aquifer		Lloyd aquifer	Lloyd Sand Member
	Lower Cape Fear aquifer		Middle Potomac confining unit		Patapsco confining unit				Confining unit		Confining unit			E .
	Confining unit		comming unit				Patapsco			741		Magothy Formation, Raritan Formation, and Potomac Group,		
	Lower Cretaceous aquifer				Patapsco aquifer	Patapsco Formation	aquifer					undifferentiated		
			Middle Potomac aquifer	Potomac Formation		Gro		Potomac Group, Potomac						
		Unnamed beds		1.04	Potomac confining unit	Arundel Formation	Potomac confining unit	entiated Formation	Lower Potomac- Raritan- Magothy aquifer	Potomac Group	Lower Potomac- Raritan- Magothy aquifer			
Early Cretaceous			Lavar Patawas	الطاط		Formation	Somming direct							
			Lower Potomac confining unit		Patuxent aquifer	Patuxent Formation	Patuxent aquifer		J. V					
			Lower Potomac aquifer		المنار				Jan .		L - :			
			Confining unit Waste Gate aquifer (saltwater)	Waste Gate Formation of the Potomac Group of Hansen (1982)–			Confining unit Waste Gate aquifer (saltwater)	Waste Gate Formation of Hansen (1982)		7.24				
			(saitwater)	Delmarva Peninsula			(SULTABLE)	Unnamed beds		184 9.3		Unnamed beds		
Jurassic		Unnamed beds		Unnamed beds									F	rom Trapp (1992, pl.

EXPLANATION

(The chart is not drawn to scale; vertical intervals are not proportionate to either thickness or geologic time.)

Regional-aquifer number2, name, and description

Gap in stratigraphic section. (Not all gaps are shown)

Hydrogeologic unit extends beyond this level in stratigraphic section.

Surficial aquifer—The aquifer consists of unconsolidated sand and gravel in valley, terrace, dune, beach, and marine deposits, and glacial deposits on Long Island, N.Y. It is unconfined but contains local confined zones. The average thickness on Long Island is about 250 ft and probably about 50 ft elsewhere but as much as 250 ft in buried channels on the Delmarva Peninsula. Average transmissivity is about 27,000 ft²/day on Long Island and less than 1,000 ft²/day elsewhere (except on the Delmarva Peninsula, where it is commonly 8,000 ft²/day and ranges up to 20,000 ft²/day in buried channels).

Upper Chesapeake aquifer—The aquifer consists of fine sand of marine origin in North Carolina but grades northward to New Jersey into coarser sands and gravels of fluvial origin. Average total thickness penetrated by wells is about 75 ft in North Carolina, 140 ft in Virginia, 400 ft in Maryland and Delaware, and 190 ft in New Jersey. The thicknesses for Maryland, Delaware, and Virginia include substantial amounts of materials of low permeability between local aquifers. Transmissivity ranges up to about 6,000 ft²/day in North Carolina, 3,000 ft²/day in Virginia, 24,000 ft²/day in Maryland just south of Delaware, and 10,000 ft²/day in New Jersey.

Lower Chesapeake aquifer—In North Carolina, the aquifer consists of fine to medium phosphatic marine sands, and in Virginia, very fine to fine sand. In Maryland and Delaware, permeable zones of medium to coarse sand with shells are separated by beds of silt and clay. In New Jersey, the aquifer is composed of fine to coarse sand and gravel. The average total thickness penetrated by wells is about 50 ft in North Carolina, 275 ft on the Delmarva Peninsula, and 200 ft in New Jersey. Transmissivity generally ranges up to 8,000 ft²/day in North Carolina, 4,000 ft²/day on the Delmarva Peninsula, and 10,000 ft²/day in New Jersey.

Castle Hayne-Piney Point aquifer—The aquifer consists of limestone, sandy marl, and fine to coarse lime sand in North Carolina and fine to coarse glauconitic sand with shells from Virginia through New Jersey. The average thickness penetrated by wells is about 185 ft in North Carolina, 60 ft in Virginia, 150 ft in Maryland and Delaware, and 125 ft in New Jersey. Transmissivity generally ranges up to 70,000 ft²/day in North Carolina and 5,000 ft²/day from Virginia to New Jersey.

Beaufort-Aquia aquifer—The aquifer consists of fine to medium sand with thin shell and limestone beds in North Carolina and Virginia and medium to coarse glauconitic sand in Maryland and Delaware. In New Jersey, the aquifer consists of sparsely glauconitic quartz sand, calcareous in part. The average thickness penetrated by wells is about 90 ft in North Carolina, 45 ft in Virginia, 120 ft in Maryland and Delaware, and 70 ft in New Jersey. Transmissivity is generally less than 2,000 ft²/day but ranges up to about 5,000 ft²/day on the Delmarva Peninsula.

Peedee-Severn aquifer—The aquifer consists of fine to medium, locally glauconitic sand interbedded with silt and clay in North Carolina, fine-grained glauconitic sand in Maryland and Delaware, and very fine to coarse, slightly glauconitic sand in New Jersey. The average thickness penetrated by wells is about 95 ft in North Carolina, 80 ft in Maryland, 100 ft in Delaware, and 80 ft in New Jersey. Transmissivity of the freshwarter part of the aquifer ranges up to about 10,000 ft²/day in North Carolina but is generally less than 2,000 ft²/day from Maryland to New Jersey.

Black Creek-Matawan aquifer—The aquifer consists of lignitic, glauconitic, partly clayey sand in North Carolina, fine silty to clayey sand in Maryland and Delaware, and fine to medium quartz sand in New Jersey. The average thickness penetrated by wells is about 180 ft in North Carolina and 55 ft in New Jersey. The aquifer is thin to missing in Maryland and Delaware. Transmissivity of the freshwater part ranges up to 10,000 ft²/day in North Carolina but is generally less than 2,000 ft²/day in other areas.

Magothy aquifer—The aquifer consists generally of very fine to medium quartz sand with abundant discontinuous layers of carbonaceous clayey silt. It also contains coarse to very coarse sand and gravel, particularly in the thicker parts. On Long Island, it includes some sand and gravel of glacial origin in hydraulic contact. The average thickness penetrated by wells is about 75 ft in Maryland and Delaware, 100 ft in New Jersey, and 460 ft on Long Island. Transmissivity of the freshwater section ranges up to 6,000 ft²/day in Maryland, 3,000 ft²/day in Delaware, 10,000 ft²/day in New Jersey, and 56,000 ft²/day on Long Island.

Upper Potomac aquifer—In southern Maryland, the regional aquifer is represented by the local Brightseat aquifer, which is made up of fine sand interbedded with silty clay, and extends into northern Virginia. There it is separated from the underlying main body of the aquifer by a confining unit. The main body of the aquifer is made up of very fine to medium quartz sand interbedded with silty clay. The average thickness of the regional aquifer is about 160 ft in North Carolina and 95 ft in Virginia. In southern Maryland, west of the Chesapeake Bay, one well penetrated 245 ft of the aquifer, and a well on the Delmarva Peninsula penetrated 75 ft. Transmissivity of the freshwater section ranges up to about 6,000 ft²/day in North Carolina, 3,000 ft²/day in Virginia, and 1,000 ft²/day in Maryland.

Middle Potomac aquifer—In North Carolina, the aquifer consists of fine to medium sand, with some coarse sand and gravel, feldspathic sand, and silty clay. In Virginia through New Jersey, it consists of fine to coarse sand, predominantly medium interlensing with much clay and silt. On Long Island, it consists of fine to coarse sand and gravel with interbedded clay and silt and includes some sand and gravel of glacial origin in hydraulic contact. The average thickness, as penetrated by wells, is about 285 ft in North Carolina, 350 ft in Virginia, 770 ft in Maryland and Delaware, 245 ft in New Jersey, and 225 ft on Long Island. Transmissivity of the freshwater section ranges up to about 8,000 ft²/day in North Carolina; 16,000 ft²/day in Virginia, Maryland, Delaware, and New York; and 21,000 ft²/day in New Jersey.

Lower Potomac aquifer—In North Carolina, the freshwater section of the aquifer, restricted to a small area south of the Virginia border, consists of lenses of fine to medium sand interbedded with clayey and silty material. In Virginia, Maryland, Delaware, and New Jersey, the aquifer consists of lenses of fine to very coarse sand with interstitial clay interbedded with silt and clay. The coarser grained materials are concentrated near its western limit, and the proportion of clayey and silty beds increases toward the coast. The average thickness of the interval between the top of the lower Potomac and the basement, as penetrated by wells, is about 285 ft in North Carolina, 525 ft in Virginia, 935 ft in Maryland and Delaware, and 345 ft in New Jersey. The wells used to derive these averages are concentrated in the updip area, where the aquifer is thinnest. However, the averages include thicknesses of sediment between the base of the aquifer and the basement. Transmissivity of the freshwater section generally ranges up to 8,000 ft²/day in Virginia, 6,000 ft²/day in Maryland, 4,000 ft²/day in Delaware, and 10,000 ft²/day in New Jersey.

Sediments underlying the lower Potomac aquifer—These sediments include clay and silt and at least one brine aquifer, the Waste Gate aquifer of Hansen (1982, 1984).

Abbreviations—aq. ..aquifer; c.u. ..confining unit; dep. ..deposits; Form. ..Formation; ft. ..feet; ft²/day. ..feet squared per day; gr. ..group; L. ..Lower; S. aq. ..Surficial aquifer; U. ..Upper; und. ..undifferentiated.

¹Recent work on cores from two test holes, one in northern Virginia and the other in southern Maryland, has identified fossil pollen and spores of late Early Cretaceous (Albian) age (D.J. Nichols, U.S. Geological Survey, written commun., 1985; Ronald Litwin, U.S. Geological Survey, written commun., 1987) in deposits designated the Brightseat aquifer in this report. This indicates that the Brightseat aquifer does not correlate with the Brightseat Formation. This plate shows the original interpretation.

²The aquifer numbers refer to the modeling layers of Leahy and Martin (1993), except that on Long Island, N.Y., the surficial aquifer is represented by model layers 7 and 6 and the Magothy aquifer by layers 5, 4, and 3. Model layer 3 comprises both the regional upper Potomac (3S) and the Magothy (3N) aquifers.

RELATIONS AMONG REGIONAL AQUIFERS, LOCAL HYDROGEOLOGIC UNITS, AND GEOLOGIC FORMATIONS IN THE NORTHERN ATLANTIC COASTAL PLAIN